



Military Munitions Response Program Remedial Investigation

February 6, 2014



Military Munitions Response Program

Munitions Response Sites

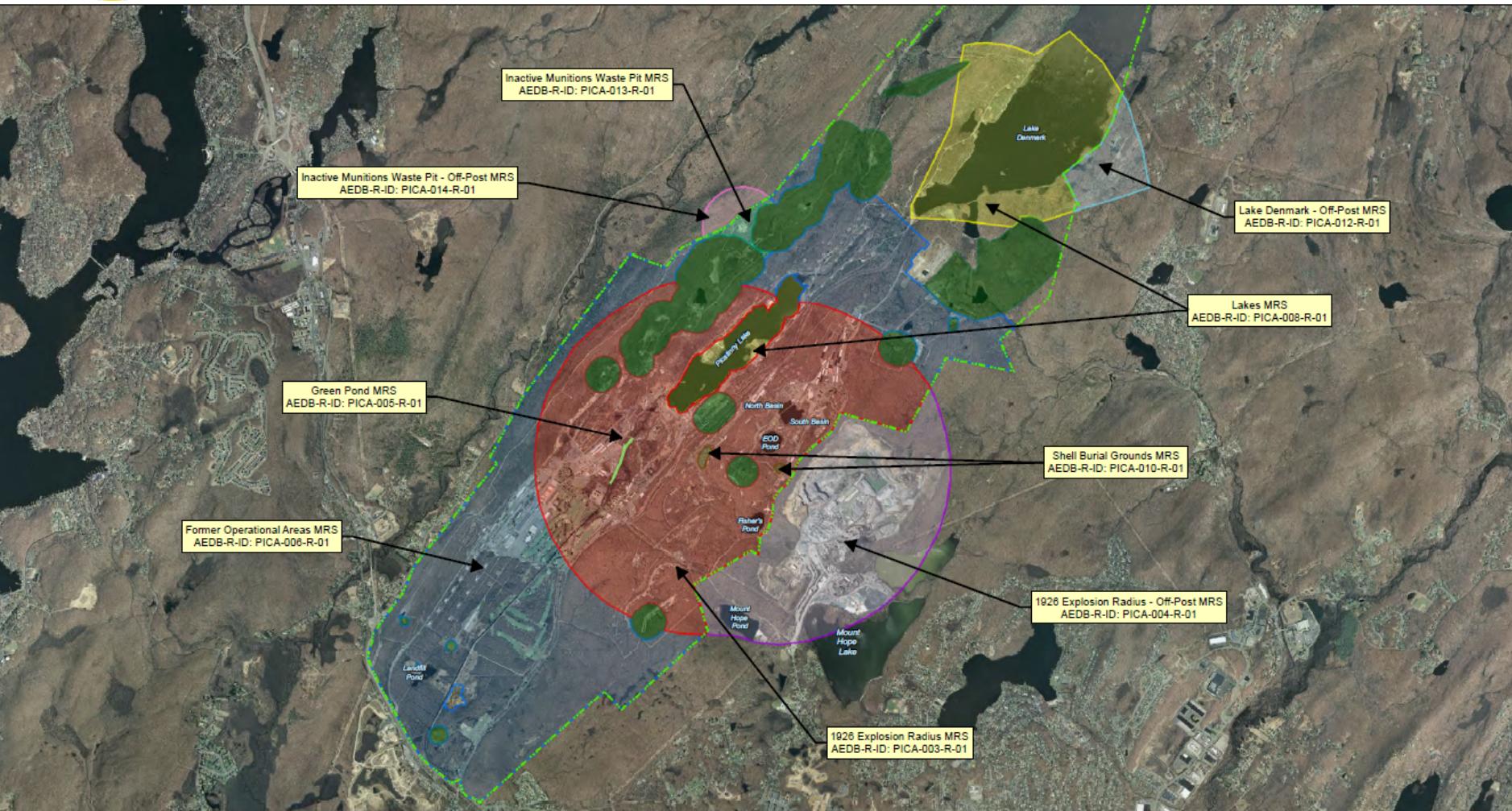


Munitions Response Site (MRS)	AEDB-R ID	Area
1926 Explosion Radius	PICA-003-R-01	1,544 acres
1926 Explosion Radius - Off-Post	PICA-004-R-01	838 acres
Shell Burial Grounds	PICA-010-R-01	5.7 acres
Green Pond	PICA-005-R-01	1.1 acres
Former Operational Areas	PICA-006-R-01	1,880 acres
Lakes MRS	PICA-008-R-01	741 acres
Lake Denmark - Off-Post	PICA-012-R-01	113 acres
Inactive Munitions Waste Pit	PICA-013-R-01	21 acres
Inactive Munitions Waste Pit - Off-Post	PICA-014-R-01	39 acres
	TOTAL	5,182.8 acres



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Munitions Response Sites



Legend	
	Installation Boundary
	Operational Range Areas
Munitions Response Sites	
	1926 Explosion Radius
	1926 Explosion Radius - Off-Post
	Former Operational Areas
	Green Pond
	Inactive Munitions Waste Pit
	Inactive Munitions Waste Pit - Off-Post
	Lake Denmark - Off-Post
	Lakes
	Shell Burial Grounds

NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84, Units: Feet

Picatinny Arsenal
Morris County,
New Jersey

Figure 1-2
Location of
Munitions Response Sites

10/14/2013 Contract # W912DR-09-D-0006
DO 0002

File: Y:\Picatinny\MXD\RI_Sep2012\AirtMRS_Loc.mxd



0

3,000

6,000

Feet

0

750

1,500

2,250

Meters

Created By: CLR
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Approved By: RSS



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Investigation Summary



- A statistical characterization strategy was developed for each MRS based on their respective conceptual site models (CSM).
- Analog and digital geophysical mapping (DGM) surveys (terrestrial and underwater) were performed along pre-planned transects and at grids based on the investigation approach.
- Anomalies detected during the geophysical surveys were intrusively investigated.
- Intrusive investigation results were tracked and tabulated for assessment during the RI.
- MC sampling was conducted based on intrusive investigation results.



EM61-MK2 gurney



Underwater DGM



Resistivity



Diving



EM31



White's



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Investigation Summary



MRS	Geophysical Survey Coverage						Anomalies Investigated	Quantity of MEC	Quantity of MD			
	Transect Approach				Grid Approach							
	Mag & Dig (ft)	DGM (ft)	Analog Detection Density (ft)	ER (ft)	Mag & Dig	DGM						
1926 Explosion Radius and 1926 Explosion Radius - Off-Post	-	-	13,844	-	93 grids/ 5.33 acres	39 grids/ 2.23 acres	2,928	14	973			
Shell Burial Grounds	-	15,313	-	4,660	-	-	0	0	0			
Green Pond Brook	2,160	2,703	-	-	-	-	562	0	58			
Former Operational Area	218,910	70,650	13,443	-	1 grid/ 0.05 acres	7 grids/ 0.4 acres	3,194	75	444			
Lakes	78,837	31,439	-	-	-	2 grids/ 0.82 acres	268	2	44			
Inactive Munitions Waste Pit	830	6,163	3,020	-	1 grid/ 0.05 acres	-	14	0	1			
Inactive Munitions Waste Pit - Off-Post	6,780	-	-	-	-	-	6	0	4			
Lake Denmark - Off-Post	-	-	30,817	-	-	-	0	0	0			
Project Total	307,517 ft or 58 miles	126,268 ft or 24 miles	61,124 ft or 11 miles	4,660 ft or 0.9 miles	95 grids/ 5.43 acres	48 grids/ 3.45 acres	6,972	91	1,524			

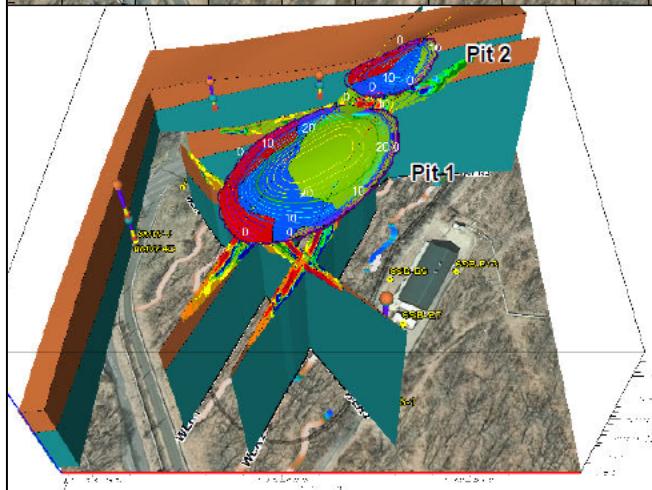


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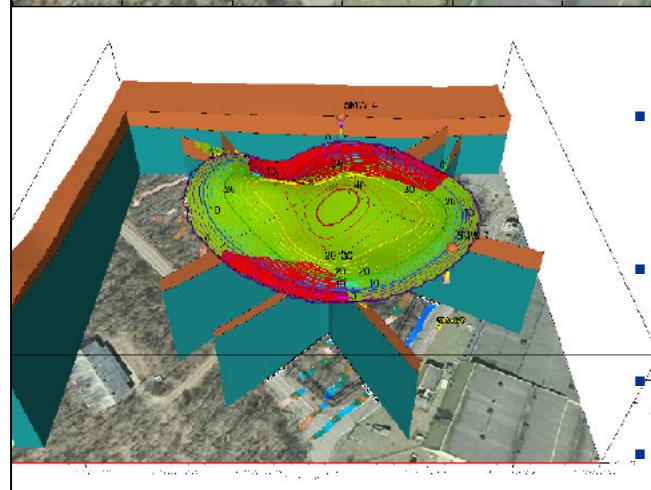
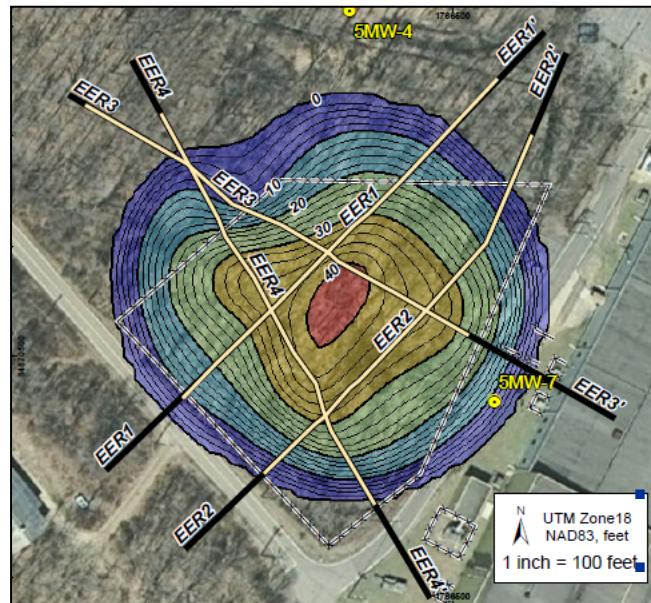
Shell Burial Grounds



West



East



Legend

Map View

- Well Locations (Yellow Dot)
- Resistivity Transect (Yellow Line)
- Geologic Section Line (Black Line)
- Fenceline (X-X-X)
- Crater Depth (feet)
 - < 10 (Purple)
 - 10 - 20 (Light Blue)
 - 20 - 30 (Light Green)
 - 30 - 40 (Yellow)
 - > 40 (Red)

Shell Burial Grounds - West

Pit 1: 30 ft deep and contains ~33,000 cubic yards of material.

Pit 2: 15 ft deep and contains ~28,000 cubic yards of material.

Cap material averages 4 - 5 ft.

Shell Burial Grounds - East

40 ft deep and contains ~80,000 cubic yards of material.

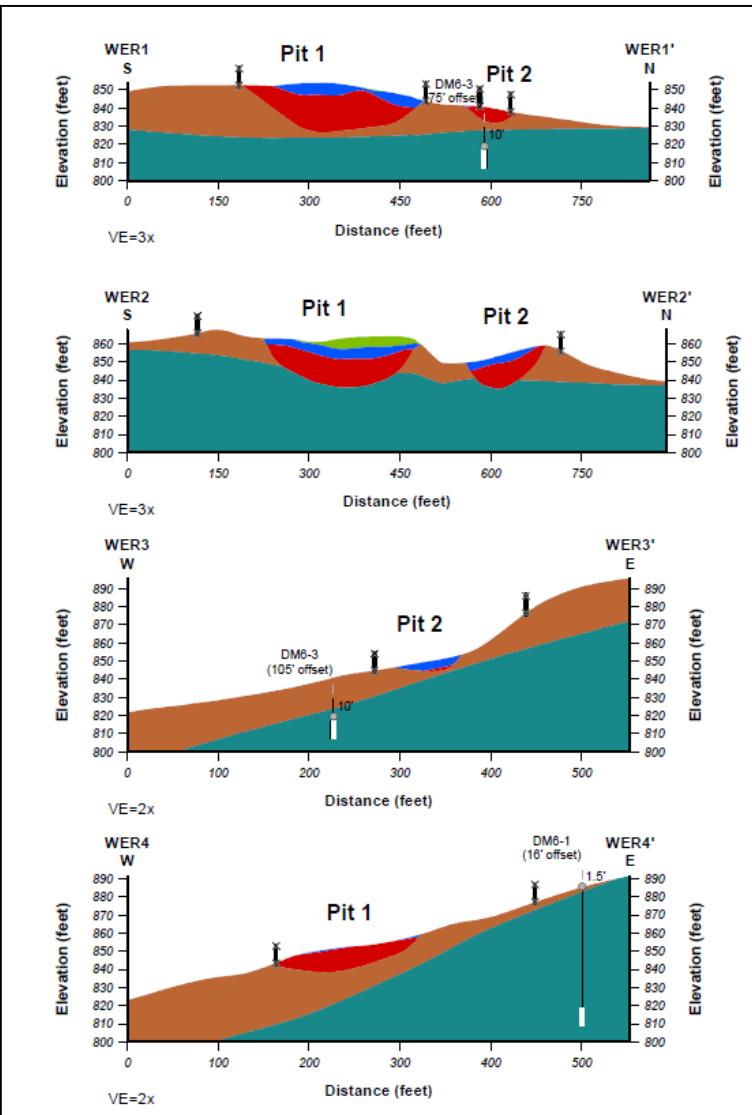


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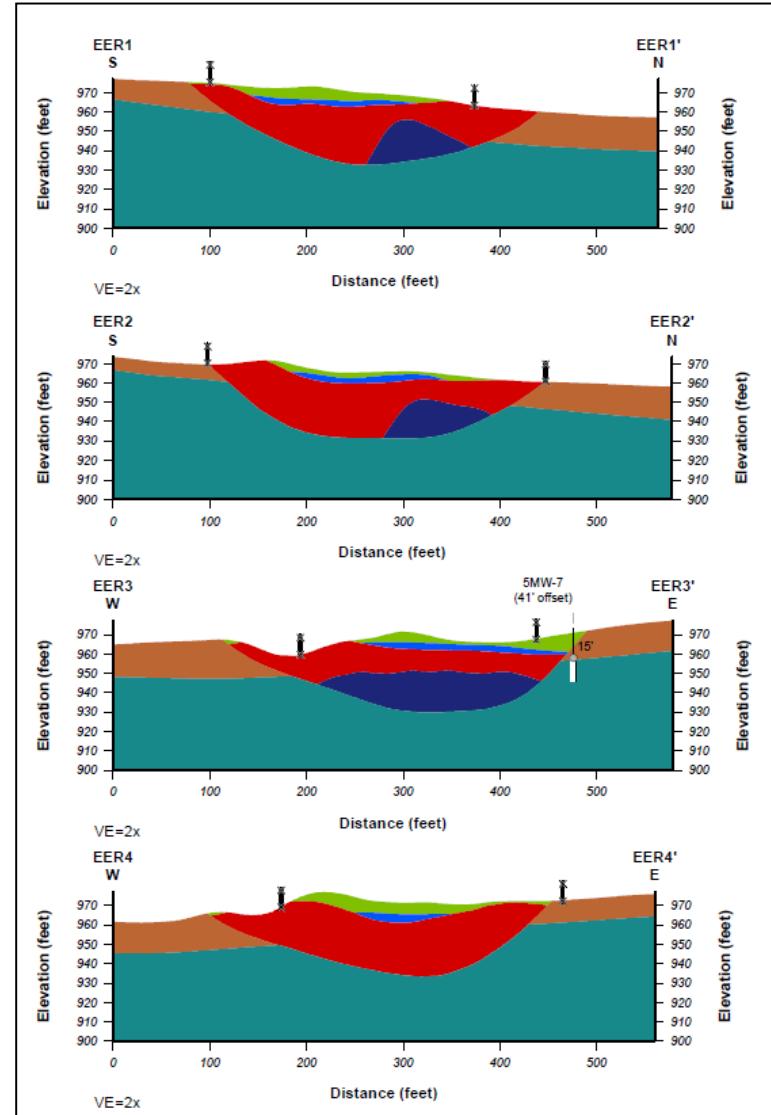
Shell Burial Grounds



West



East



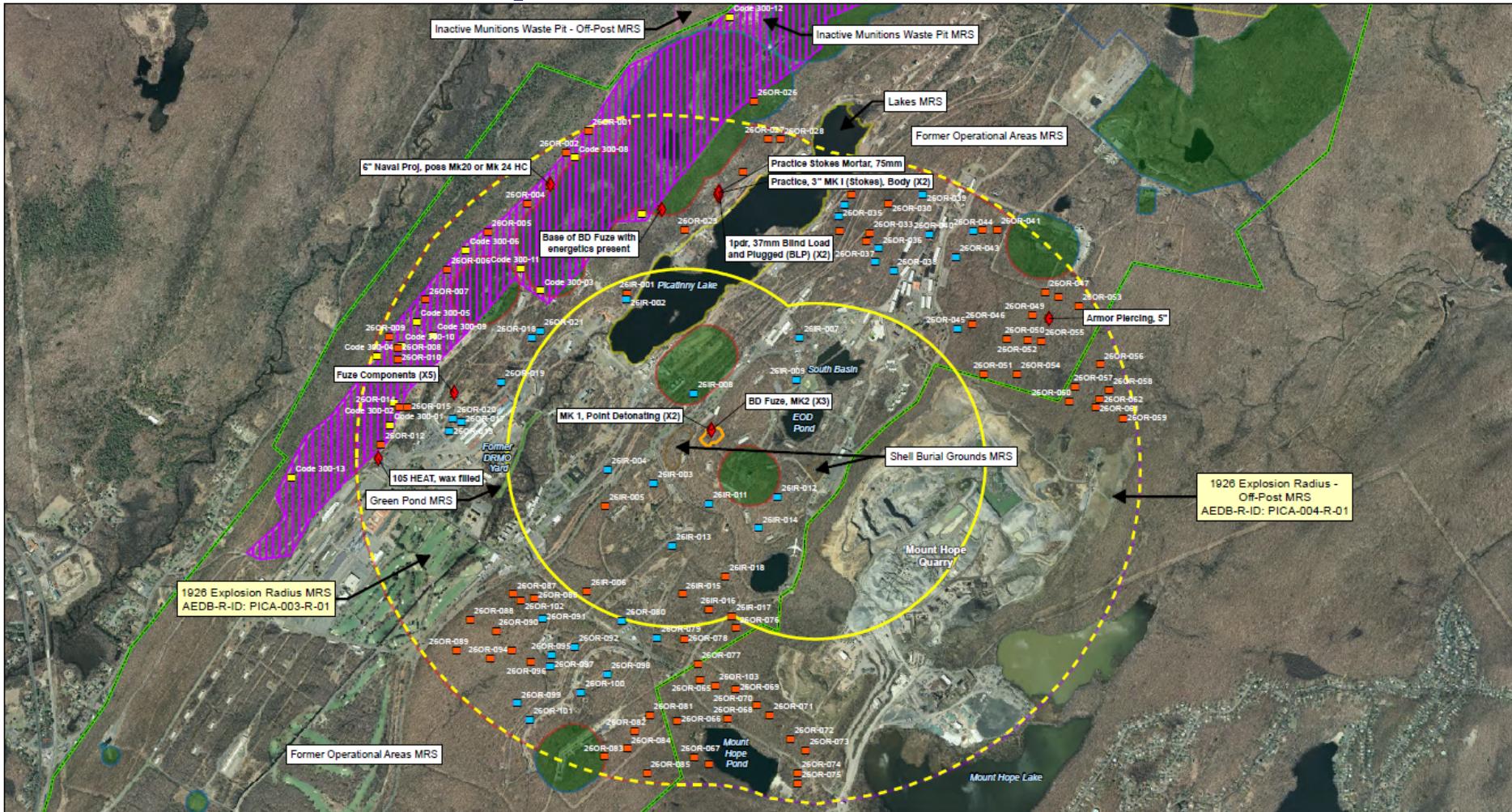


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1926 Explosion Radius

1926 Explosion Radius - Off-Post

U.S. Army
Garrison
Picatinny
Arsenal™



Legend

Installation Boundary	Munitions Response Sites
Operational Range Area	1926 Explosion Radius
Inner Radius Boundary	1926 Explosion Radius - Off-Post
Outer Radius Boundary	Inactive Munitions Waste Pit - Off-Post

Former Operational Areas	Fuze Area
Green Pond	Code 300 Area Grid (all Analog)
Lakes	Other Analog Grid
Inactive Munitions Waste Pit	DGM Grid
Inactive Munitions Waste Pit - Off-Post	UXO/DMM/MPPEH Find

NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: New Jersey State Plane
Datum: NAD83. Units: Feet

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New Jersey



Figure 6-4
1926 Explosion Radius MRS
MEC Finds

6/27/2013 Contract # W912DR-09-D-0006
DO 0002

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Verified By: XXX
Approved By: XXX



Military Munitions Response Program

Green Pond Former DRMO Yard

U.S. Army
Garrison
Picatinny
Arsenal™



Legend		
Former DRMO Yard	Cultural Debris	UXO Finds Map Items
Green Pond MRS	Geology	Munitions Debris
★ UXO	● MEC	● Munitions Debris
● Munitions Debris		

Note: Some Munitions Debris items were identified at the same locations

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84 Units: Feet

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Figure 6-1
Green Pond Brook MRS
Intrusive Results

12/5/2013 Contract # W912DR-09-D-0006
DO 0002

Y:\Picatinny\MXDR\1_Sep2012\ARWTC\Greenpond_DRMO_Yard_Results_v2.mxd



N

0

200

400

Feet

0

70

140

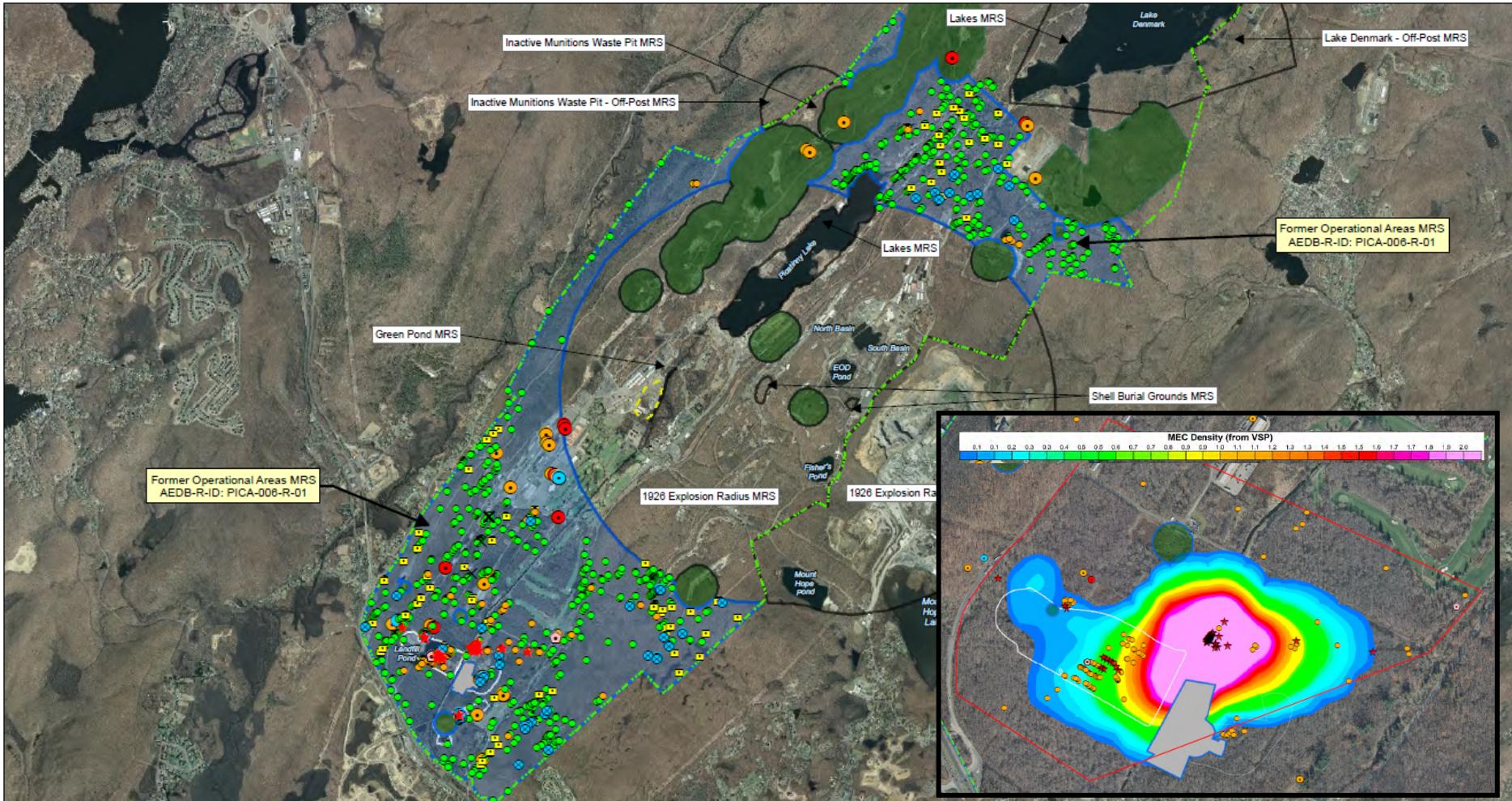
Meters

Created By: CLR
Verified By: NAS
Approved By: RSS



Military Munitions Response Program

Former Operational Areas



Legend	Areas of Interest	Geology	UXO Finds Map Items
Installation Boundary		Geology	UXO Finds Map Items
Operational Range Areas	DMM	Munitions Debris	Munitions Debris
Ineligible Area - Burning Ground	UXO	Seed	Seed
Former DRMO Yard		Small Arms	Small Arms
Munitions Response Sites		Cultural Debris	Cultural Debris
Former Operational Areas			

NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layer (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

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Figure 6-12
Former Operational Areas MRS
Intrusive Results

N
0 2,500 5,000
0 620 1,240 1,860
Meters

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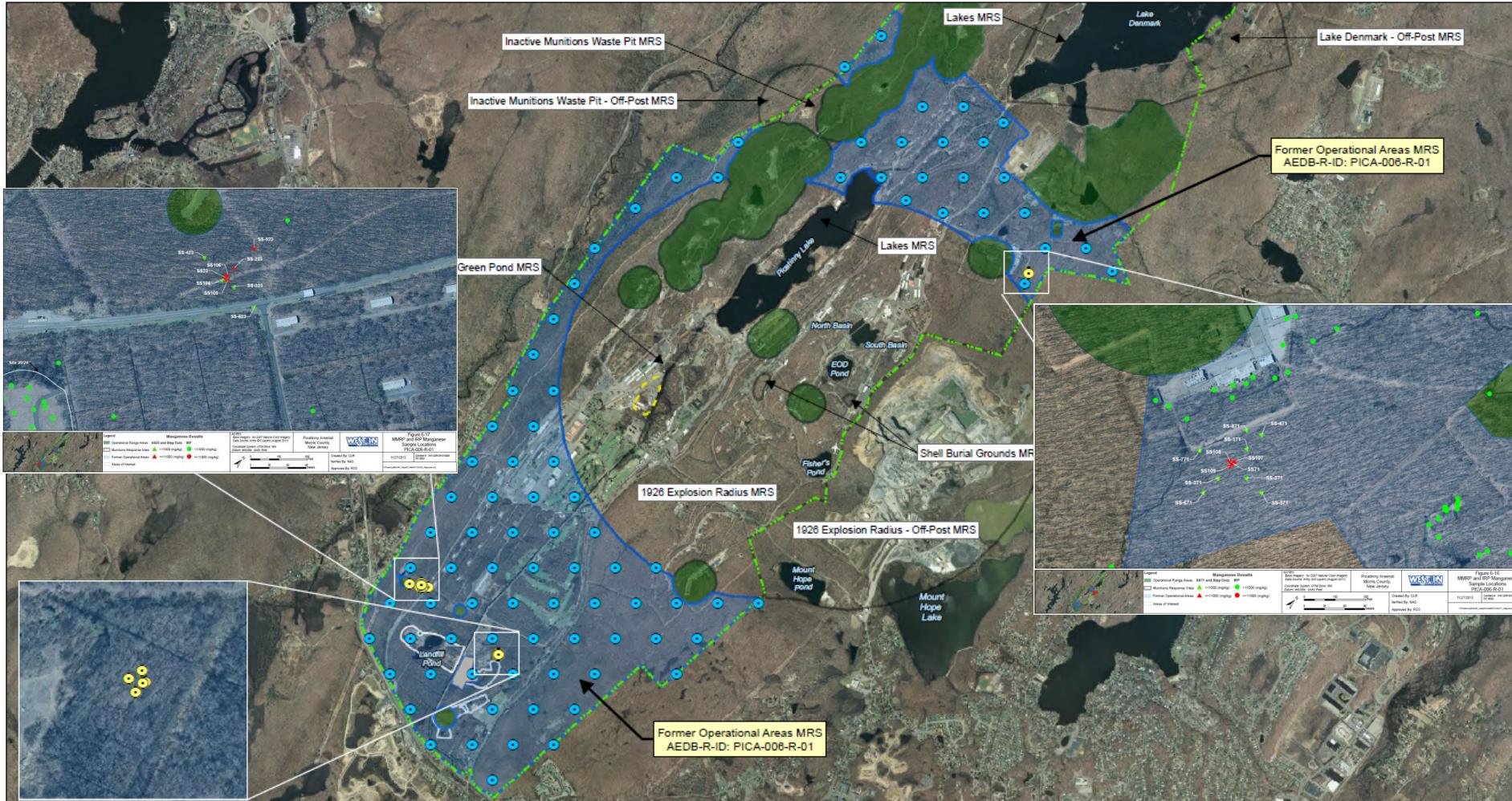
12/5/2013 Contract # W912DR-09-D-0006
DO 0002

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Military Munitions Response Program

Former Operational Areas



Legend

- Installation Boundary
- Ineligible Area - Burning Ground
- Operational Range Areas
- Former DRMO Yard
- Munitions Response Sites
- Former Operational Areas
- Step-Out Sampling Locations
- Areas of Interest

NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84, Units: Feet



0 2,500 5,000 Feet

0 620 1,240 1,860 Meters

Picatinny Arsenal
Morris County,
New Jersey



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Approved By: RSS

Figure 5-30
Former Operational Areas MRS
MC Sampling Locations

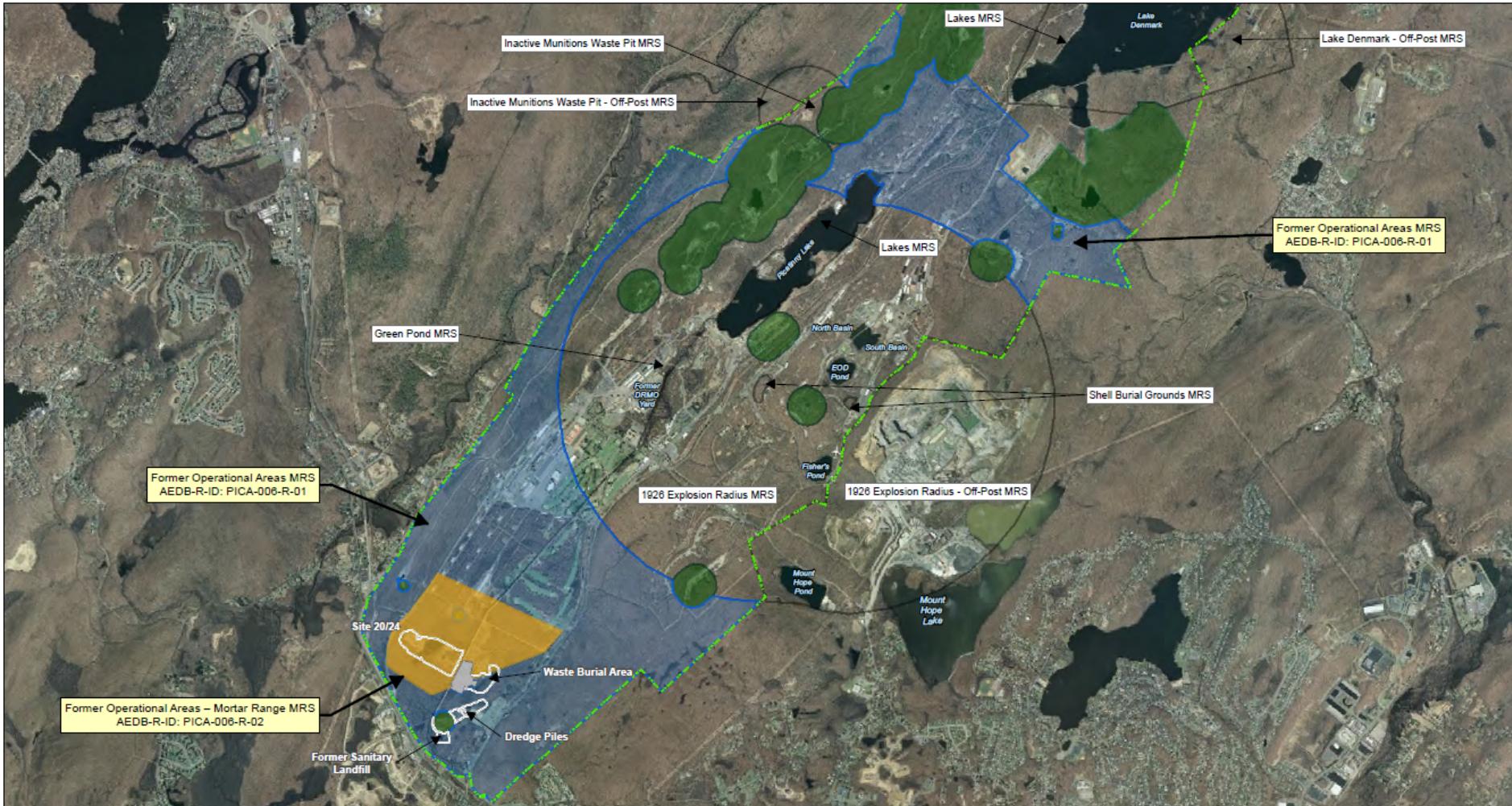
10/24/2013 Contract # W812DR-09-D-0006
DO 0002

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Military Munitions Response Program

Former Operational Areas



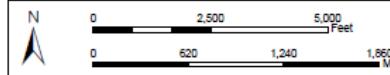
Legend	
■ Installation Boundary	■ Mortar Range MRS
■ Operational Range Areas	■ Ineligible Area - Burning Ground
■ Munitions Response Sites	
■ Former Operational Areas	
■ Areas of Interest	

NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

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Figure 11-2
Recommended MRS Division
PICA-006-R-01 and PICA-006-R-02



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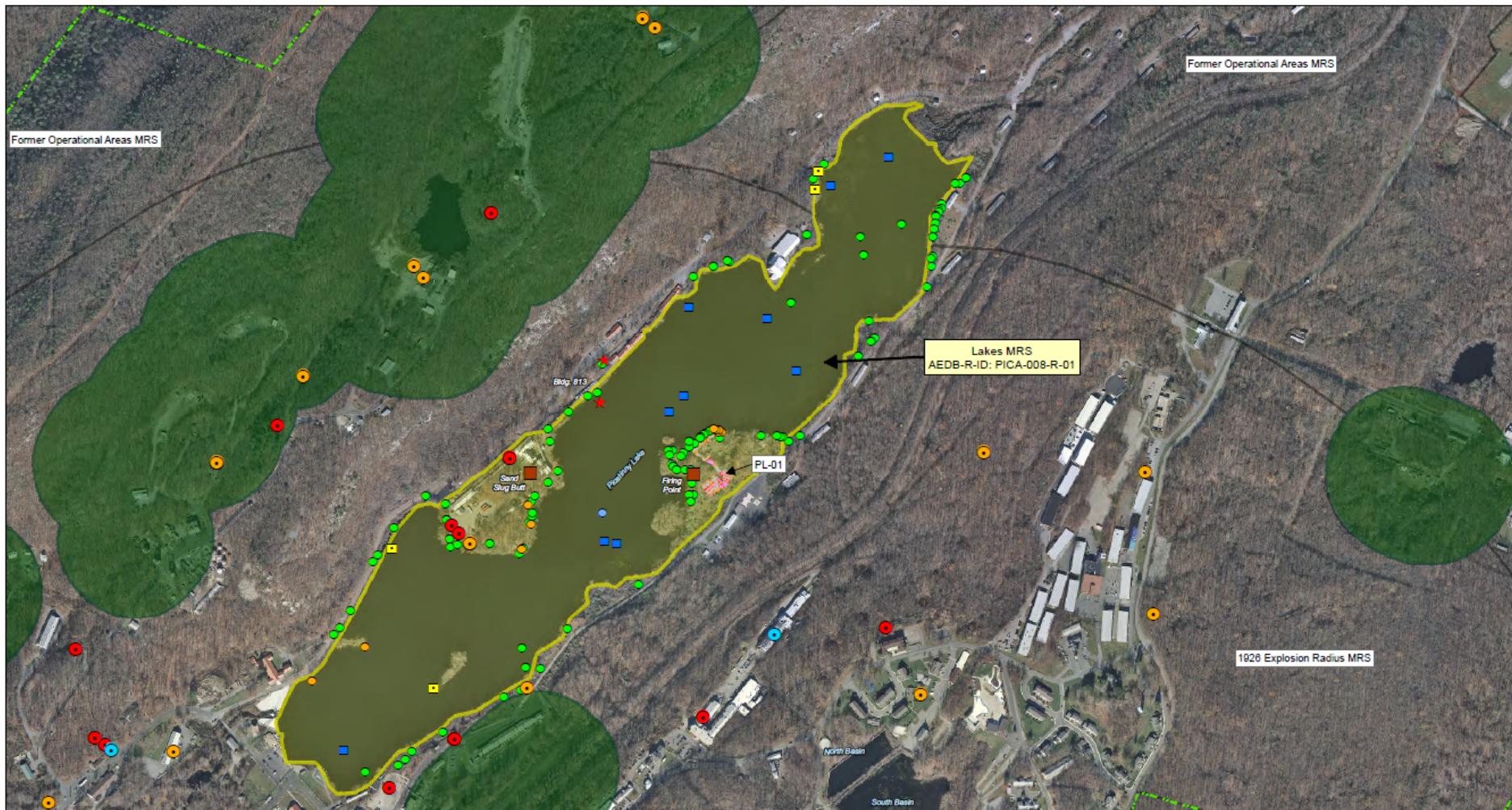
11/15/2013 Contract # W912DR-09-D-0006
DO 0002

Picatinny Arsenal, Sep2012A4NRTCFOA_MRS_Recommend_Division.mxd



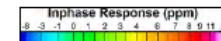
Military Munitions Response Program

Lakes - Picatinny Lake



Legend

- Installation Boundary
- Operational Range Areas
- Munitions Response Site Boundaries
- Lakes MRS
- Cultural Debris
- Geology
- UXO
- Munitions Debris
- No Contact (No audible response)
- No Find (Audible response, anomaly could not be found)
- Firing Point and Slug Butt
- UXO Finds Map Items
- Munitions Debris
- MEC
- Small Arms



Note: Some Munitions Debris items were identified at the same locations

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet



N

0

600

1,200

Feet

0

200

400

Meters

Picatinny Arsenal
Morris County,
New Jersey



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Approved By: RSS

Figure 6-19
Lakes MRS - Picatinny Lake Portion
Intrusive Results

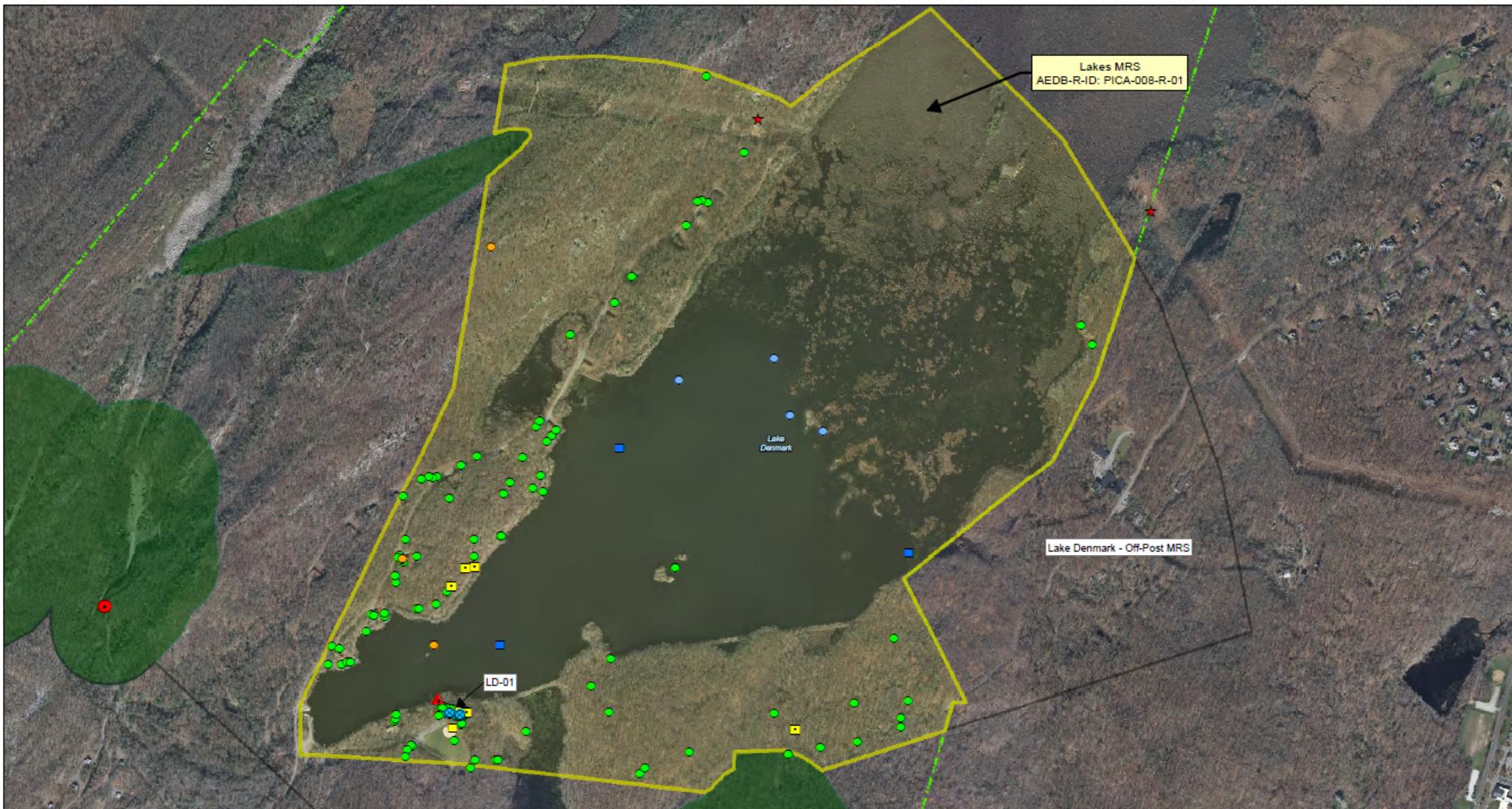
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Contract No. W912DR-09-0006
DO 0002

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Military Munitions Response Program

Lakes - Lake Denmark



Legend
Installation Boundary
Operational Range Areas
Munitions Response Site Boundaries
Lakes MRS
Grid Boundary
Cultural Debris
Munitions Debris
Geology
Small Arms
No Find (Audible response, anomaly could not be found)
Mortar recovered during PG&E work
Mortar recovered during USACG 2010 Site Walk
UXO Finds Map Items
No Contact (No audible response)
MEC

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84, Units: Feet



0 750 1,500
Feet

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Morris County,
New Jersey



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Verified By: NAS
Approved By: RSS

Figure 6-20
Lakes MRS - Lake Denmark Portion
Intrusive Results

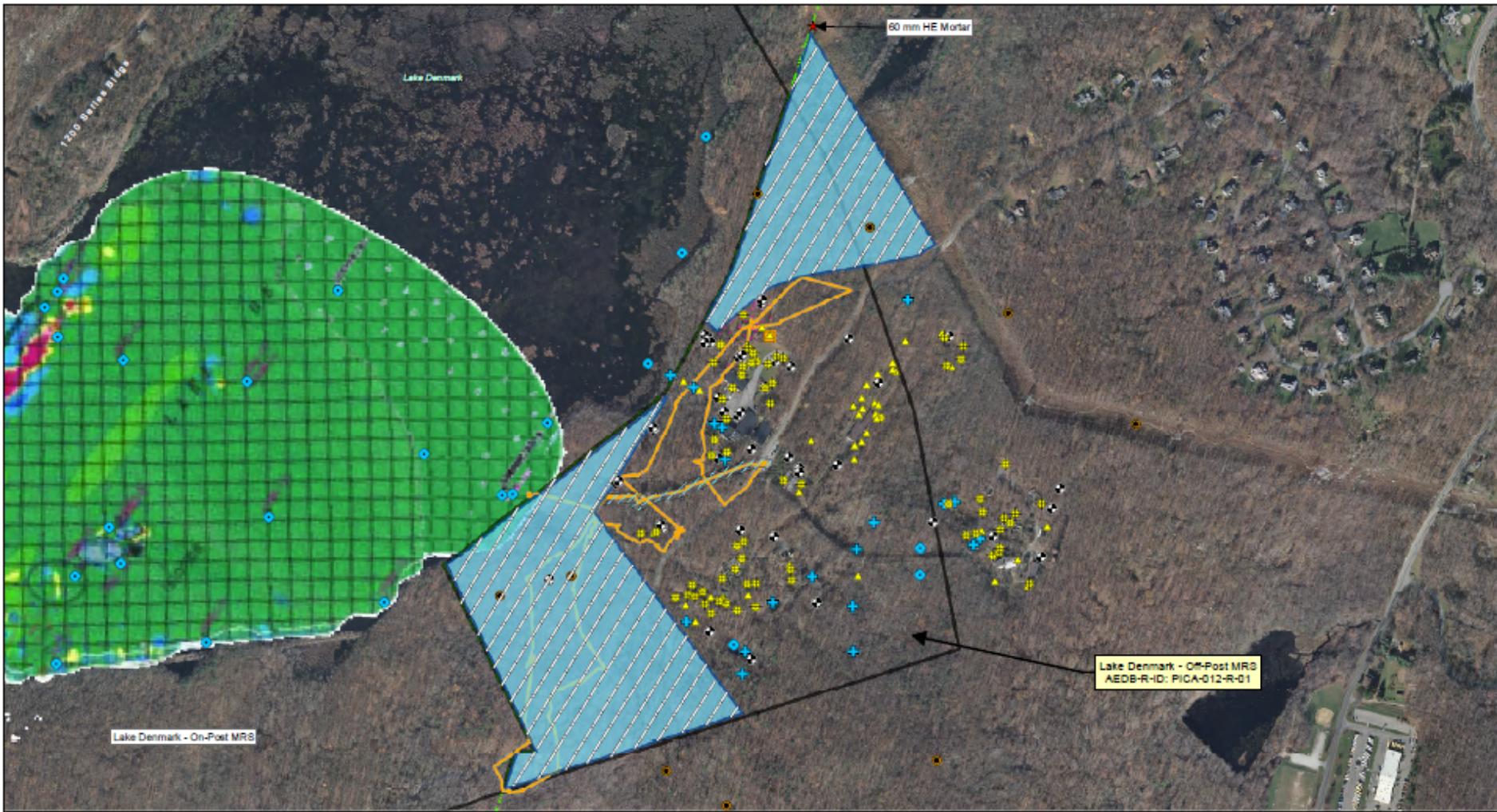
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DO 0002

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Military Munitions Response Program

Lake Denmark - Off-Post



Legend

- Installation Boundary
- Operational Range Areas
- Munitions Response Site Boundaries
- Proposed Visual Survey Area
- Visual Survey Transects
- Mortar found during PSE&G work

- Subsurface Soil Boring Locations
- Subsurface Soil Sample Locations
- Sediment Sample Locations
- Surface Water/Sediment Sample Locations
- Background Soil Sample Locations
- Monitoring Well Locations
- Berm
- Previous Geophysical Investigation
- Test Pit Locations
- SI Survey
- Approximate location of a former drum disposal area

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84, Units: Feet

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Figure 4-1
Lake Denmark - Off-Post MRS
Revised Survey Locations



N

0

500

1,000

Feet

0

175

350

Meters

Created By: CLR
Verified By: NAS
Approved By: RSS

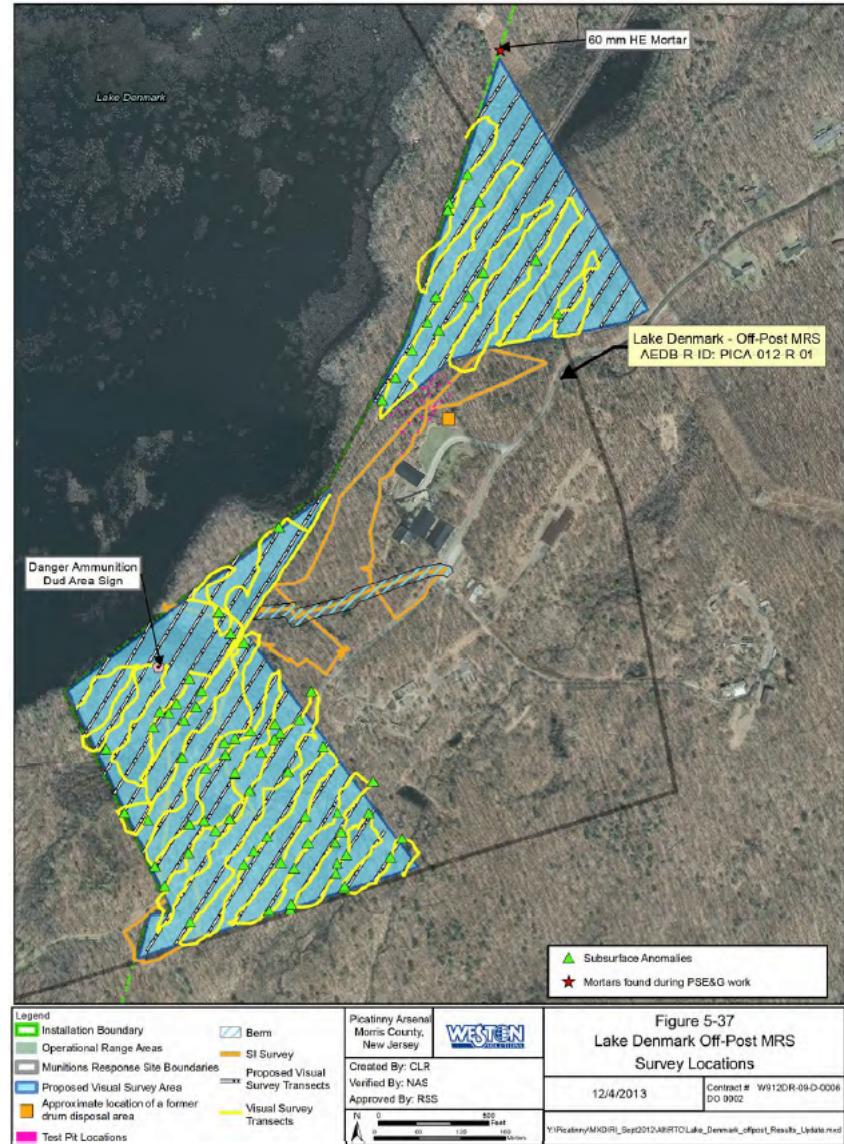
Date: 12/3/2013
Contract No. W912DR-09-D-0006
Delivery Order 0002

http://www.weston.com/updated/Lake_Denmark_09-01-revised_mrs_revised_survey_locations.pdf



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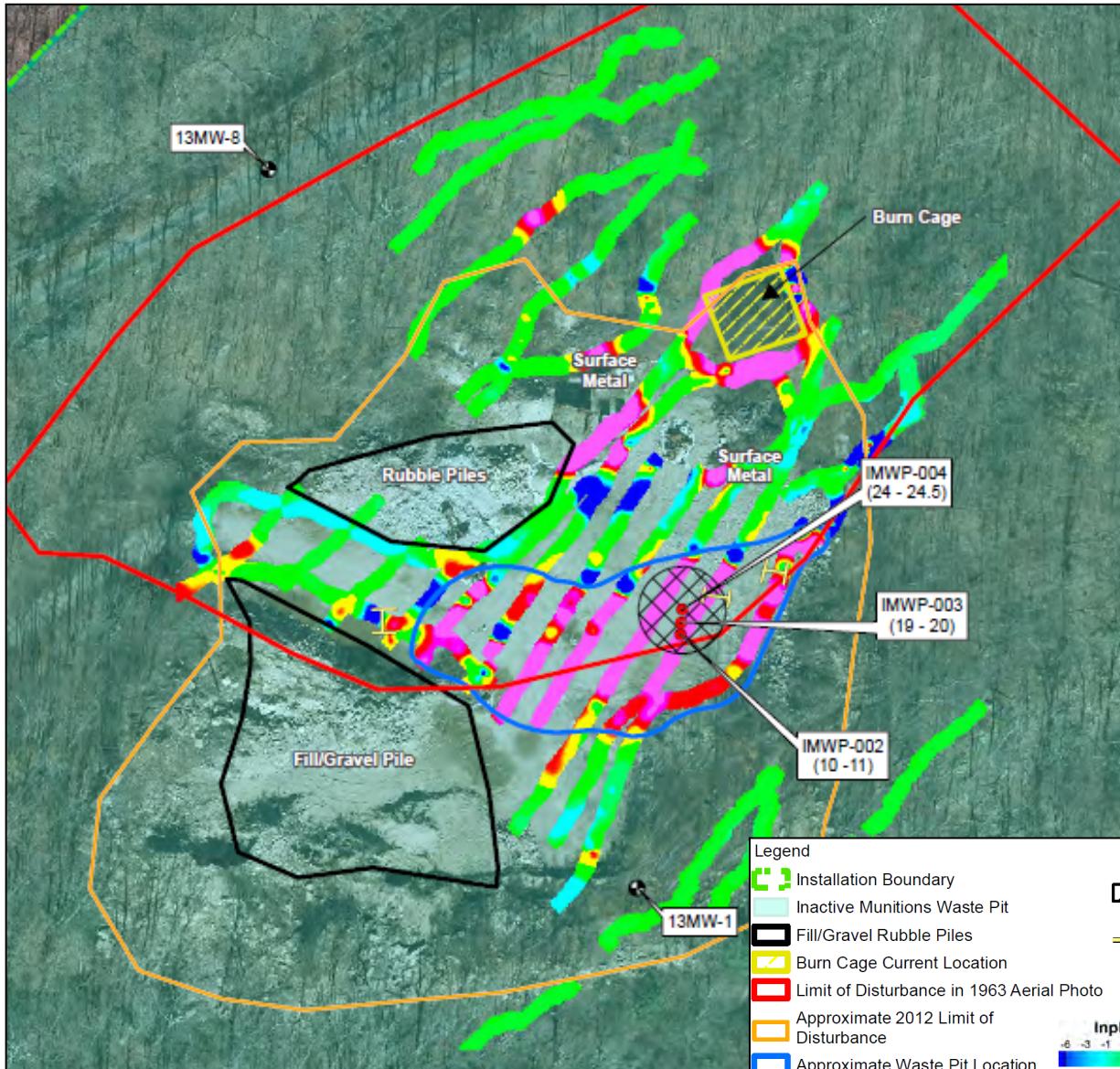
Lake Denmark - Off-Post





Military Munitions Response Program

Inactive Munitions Waste Pit

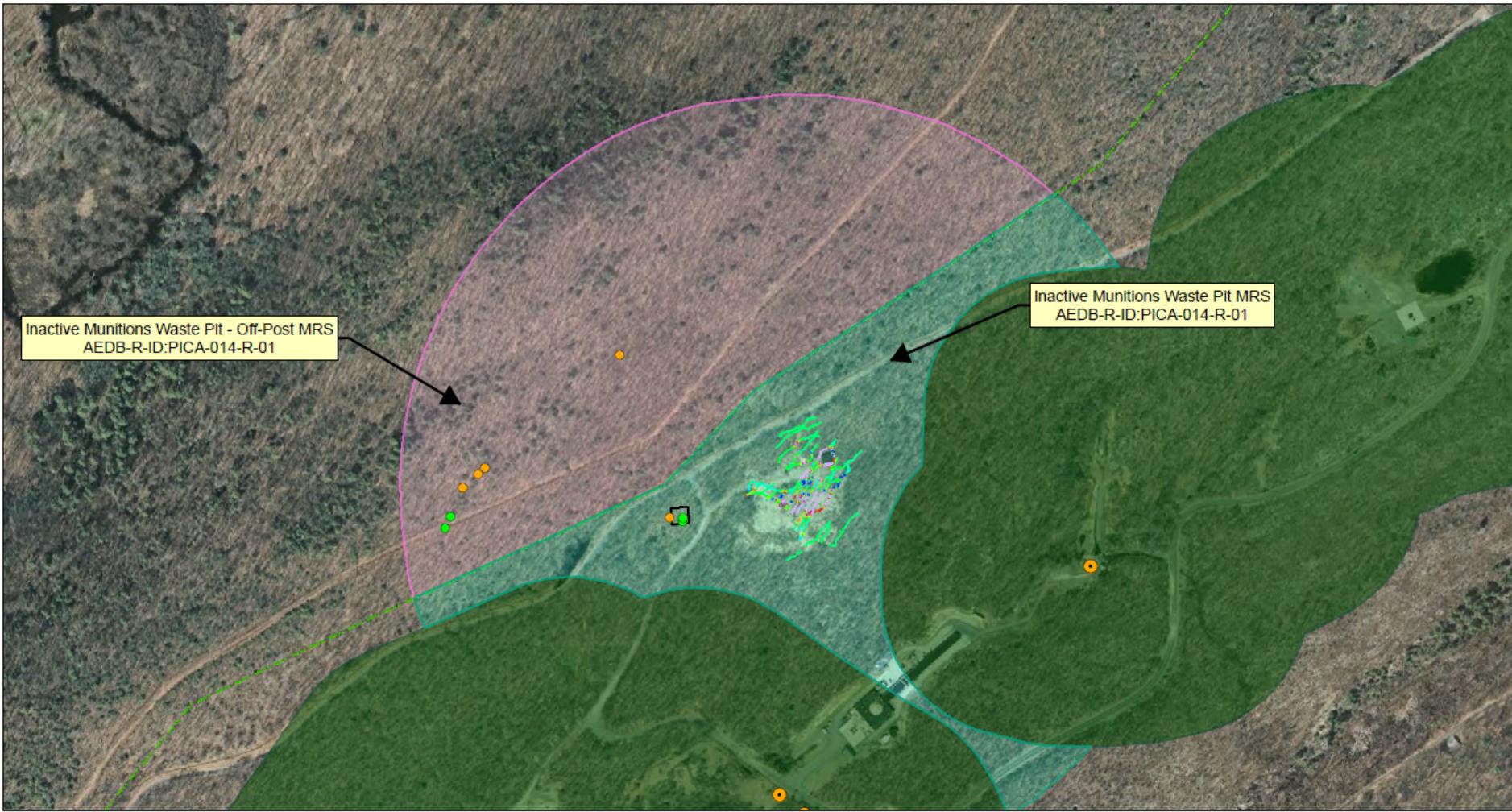




Military Munitions Response Program

Inactive Munitions Waste Pit - Off-Post

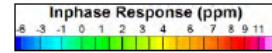
US Army Garrison
Picatinny Arsenal™



Legend

- Installation Boundary
- Operational Range Areas
- Munitions Response Sites
- Inactive Munitions Waste Pit
- Inactive Munitions Waste Pit - Off-Post
- Grid Boundary

- Cultural Debris
- Munitions Debris
- UXO Finds Map Items
- Munitions Debris



NOTES:
Base Imagery: NJ 2007 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)
Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

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Figure 6-27
Inactive Munitions Waste Pit MRS
Intrusive Results

12/4/2013 Contract # W912DR-09-D-0006
DO 0002

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0 300 600
Feet
0 70 140 210
Meters

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Verified By: NAS
Approved By: RSS

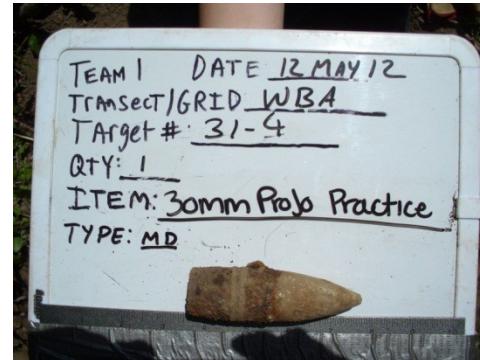


Military Munitions Response Program

Investigation Analysis



- MEC Hazard Assessments (MECHA) and MEC probability assessment.
- Risk assessments for MC.
- MRSPP updates for each MRS.





Military Munitions Response Program

Investigation Conclusions



Munitions Response Site (MRS)	MEC Assessment	MC Assessment	MRSPP	Feasibility Study
1926 Explosion Radius	Exposure pathways complete.	Exposure pathways incomplete.	3	Address explosive hazards.
Fuze Area**	Exposure pathways complete.	Exposure pathways incomplete.	3	Address explosive hazards.
1926 Explosion Radius - Off-Post	Exposure pathways complete.	Exposure pathways incomplete.	4	Address explosive hazards.
Shell Burial Grounds	Exposure pathways complete.	Exposure pathways incomplete.	5	Address explosive hazards.
Green Pond	Combined with 1926 Explosion Radius			
Former Operational Areas	Exposure pathways complete.	Exposure pathways incomplete.	3	Address explosive hazards.
Mortar Range**	Exposure pathways complete.	Exposure pathways incomplete.	3	Address explosive hazards.
Lakes MRS	Exposure pathways complete.	Exposure pathways incomplete.	4	Address explosive hazards.
Lake Denmark - Off-Post	Exposure pathways incomplete.	Exposure pathways incomplete.	No Known or Suspected MEC, CWM, or MC Hazard	Assess No Active Remediation Alternative.
Inactive Munitions Waste Pit	Exposure pathways complete.	Exposure pathways incomplete.	4	Address explosive hazards.
Inactive Munitions Waste Pit - Off-Post	Exposure pathways incomplete.	Exposure pathways incomplete.	No Known or Suspected MEC, CWM, or MC Hazard	Assess No Active Remediation Alternative.

Note: ** New MRS